KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS

COMMON TEST

MARCH 2022

MARKS: 75

TIME: 1½ hours

This question paper consists of 7 pages.

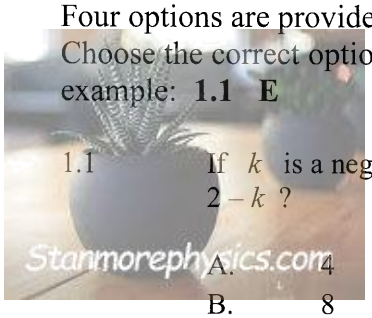
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 5 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.

QUESTION 1

Four options are provided as possible answers to the following questions.
Choose the correct option and write only the letter (A – D) next to the question number, for example: **1.1 E**



1.1 If k is a negative single digit integer, which of the following is NOT a possible value of $2-k$?

A. 4
B. 8
C. 10
D. 12

(2)

1.2 An irrational number that lies between 5 and 6 is:

A. $\sqrt[3]{28}$
B. $\sqrt{20+8}$
C. $\sqrt{20\times 8}$
D. 2π

(2)

1.3 Simplify the following: $-3x^2y\left(5xy^2+xy\right)=$

A. $-15x^2y^2-3x^2y$
B. $-15x^3y^3-3x^3y$
C. $-15x^3y^3-3x^3y^2$
D. $-15x^3y^3+xy$

(2)

1.4 The formula for the volume of a cone is $V=\frac{1}{3}\pi r^2h.$ The radius, r , of the cone may be expressed as:

A. $\sqrt{\frac{3V}{\pi h}}$
B. $\sqrt{\frac{V}{3\pi h}}$
C. $\sqrt[3]{\frac{V}{\pi h}}$
D. $\frac{1}{3}\sqrt{\frac{V}{\pi h}}$

(2)

1.5 If $(a^3+27)=(a+3)(a^2+ma+9)$, then m equals:

A. -9
B. -3
C. 9
D. 3 (2)

1.6 Factorise the following: $4x^2-3x-27=$

A. $(2x+9)(2x-3)$
B. $(2x-9)(2x+3)$
C. $(4x+9)(x-3)$
D. $(4x-9)(x+3)$ (2)

1.7 Simplify the following: $\frac{x^2-25}{25x-125}=$

A. $\frac{x}{5}$
B. $\frac{x+5}{25}$
C. $\frac{x-5}{25}$
D. $-\frac{x}{5}$ (2)

1.8 If it is given that $y^5=50$ and $x^2=10$, determine the value of $y^{10}x^{-2}$.

A. 5
B. 25
C. 50
D. 250 (2)

1.9 Which quadrilateral is equiangular but not always equilateral?

A. rectangle
B. parallelogram
C. rhombus
D. square (2)

1.10 Which of the statements below is false?

A. All parallelograms are quadrilaterals.
B. All rectangles are parallelograms.
C. All squares are rhombuses.
D. All rectangles are squares. (2)

[20]

QUESTION 2

2.1 Determine the product of the following and simplify fully:

$(a+2)(a^2-2a+8)$ (2)

2.2 Factorise the following expressions fully:

2.2.1 x^3-y^9 (2)

2.2.2 $f+e-1-ef$ (3)

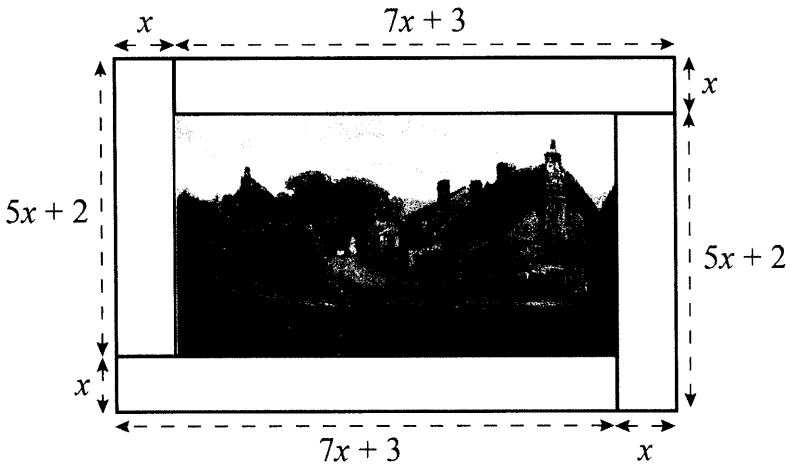
2.3 Simplify the following expressions fully:

2.3.1 $\dfrac{18^{m-2}\times 6^{-m}\times 36^{m+2}}{3^{3m}.2^{2m}}$ (4)

2.3.2 $\dfrac{y^2-y-2}{y^2-4}\times\dfrac{y^2+2y}{y^2+y}$ (4)

2.4 A picture is framed using four rectangular pieces of wood, as shown in the diagram below.

Find the area of the picture, in terms of x. Give your answer in simplified form.



(3)

[18]

Q UESTION 3

3.1 Solve for x in each of the following equations:

3.1.1 $\frac{3}{x+2}+\frac{5}{x-4}=2$ (4)

3.1.2 $5^{x-4}+5^{x}=626$ (3)

3.2 Solve for x : $-6\leq 2x-2<10$.

Illustrate your answer on a number line if x is a real number. (3)

3.3 Solve simultaneously for a and b :

$4a-b=5$
$-3a+4b=19$ (5)

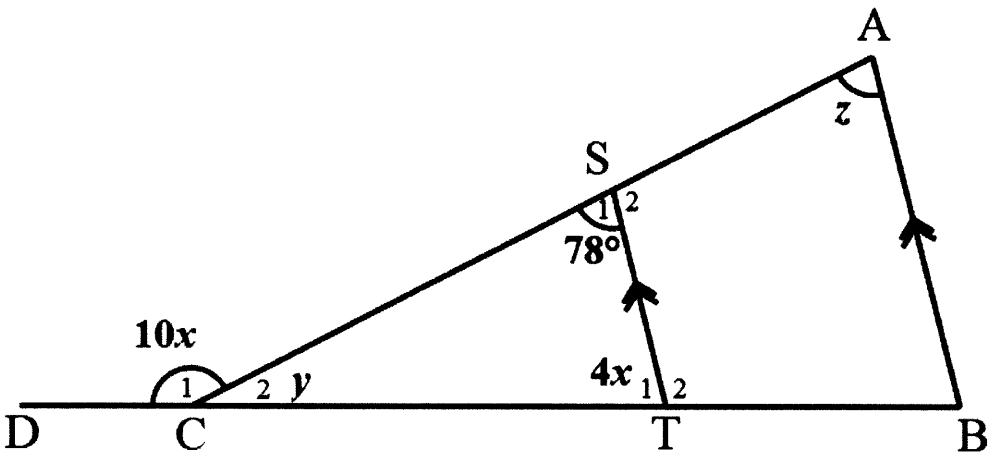
[15]

Give reasons for your statements in the answers to QUESTIONS 4 and 5.

QUESTION 4

4.1 In the diagram below, ΔABC is drawn with $AB\square$.

$\hat{C}_1=10x$, $\hat{C}_2=y$, $\hat{S}_1=78°$, $\hat{T}_1=4x$ and $\hat{A}=z$



Calculate, with reasons, x , y and z. (4)

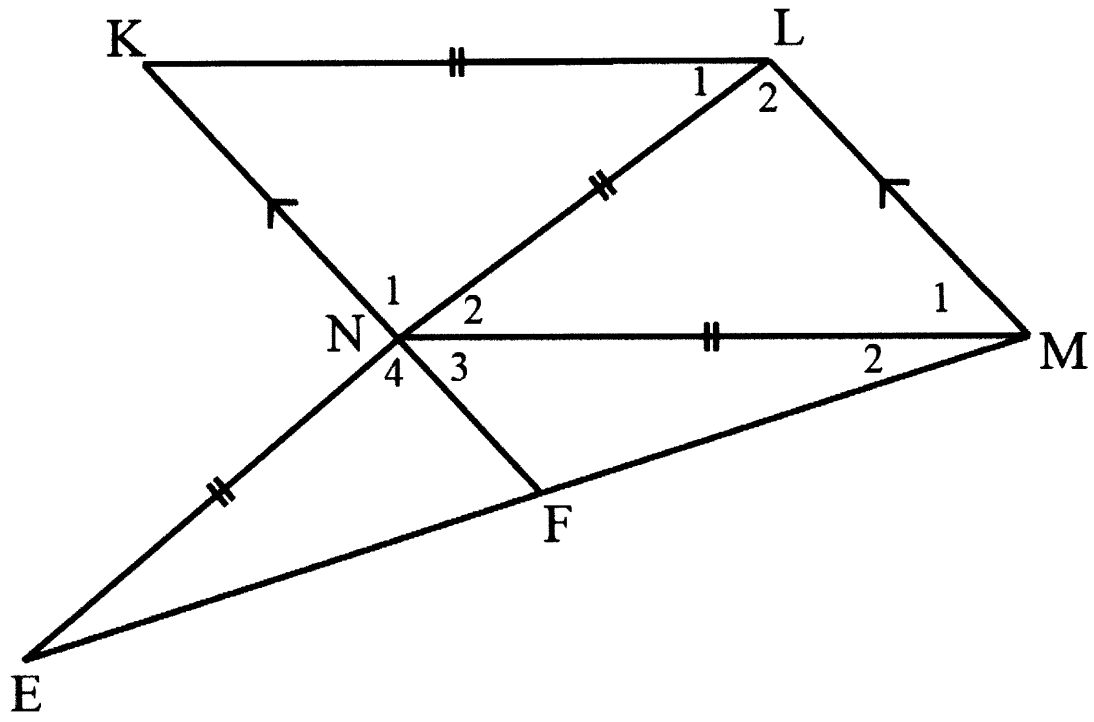
4.2 A parallelogram has two pairs of opposite sides parallel and equal.

Name 3 other quadrilaterals that have these same properties. (3)

[7]

QUESTION 5

In the diagram below, $KL = LN = NM = EN$ and KN □ .



Use the diagram above to prove the following:

5.1 $\hat{M}_1 = \hat{K}$ (3)

5.2 $\Delta KLN \equiv \Delta MNL$ (4)

5.3 $KLMN$ is a parallelogram. (3)

5.4 $L\hat{M}E = 90°$ (5)

[15]

TOTAL: 75

KWAZULU-NATAL PROVINCE
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16/03/2022

TO: THE CHIEF INVIGILATOR OF ALL SCHOOLS OFFERING: MATHEMATICS

NATIONAL SENIOR CERTIFICATE: COMMON TEST
MARCH 2022: GRADE 10

ERRATA

Please take note of the following change:

PAGE	NUMBER	ERROR	CORRECTION
6	4.1	ΔABC is drawn with AB □	**AB // ST.**
7	Question 5 Instruction	In the diagram below, $KL = LN = NM = EN$ and KN□	In the diagram below, $KL = LN = NM = EN$ and $KN // LM$

Kindly ensure that candidates are informed of the Errata.

MR C. KHUMALO
PROVINCIAL EXAMINATIONS
AND ASSESSMENT SERVICES

16/03/2022
DATE

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MARKING GUIDELINE

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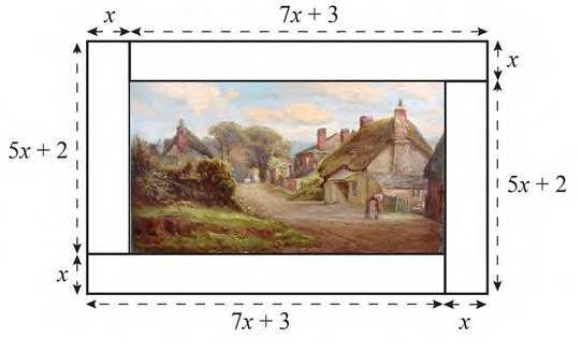
This memorandum consists of 6 pages.

QUESTION 1

1.1	D	✓✓ answer	(2)
1.2	B	✓✓ answer	(2)
1.3	C	✓✓ answer	(2)
1.4	A	✓✓ answer	(2)
1.5	B	✓✓ answer	(2)
1.6	C	✓✓ answer	(2)
1.7	B	✓✓ answer	(2)
1.8	D	✓✓ answer	(2)
1.9	A	✓✓ answer	(2)
1.10	D	✓✓ answer	(2)
			[20]

QUESTION 2

2.1	$(a+2)(a^2-2a+8)$ $=a^3-2a^2+8a+2a^2-4a+16$ $=a^3+4a+16$	✓ expand ✓ simplification	(2)
2.2.1	x^3-y^9 $=\left[x^3-\left(y^3\right)^3\right]$ $=\left(x-y^3\right)\left(x^2+xy^3+y^6\right)$	✓ $\left(x-2y^3\right)$ ✓ $\left(x^2+xy^3+4y^6\right)$	(2)
2.2.2	$f+e-1-ef$ $=f-1+e-ef$ $=1(f-1)+e(1-f)$ $=1(f-1)-e(f-1)$ $=(f-1)(1-e)$ OR $f+e-1-ef$ $=f-ef+e-1$ $=f(1-e)+(e-1)$ $=f(1-e)-1(1-e)$ $=(1-e)(f-1)$ OR	✓ common factors ✓ common bracket ✓ answer ✓ common factors ✓ common bracket ✓ answer	(3) (3)

	$f+e-1-ef$ $=f-ef+e-1$ $=f(1-e)+(e-1)$ $=f(1-e)-1(1-e)$ $=(1-e)(f-1)$	✓ common factors ✓ common bracket ✓ answer	(3)
2.3.1	$\frac{18^{m-2}\times 6^{-m}\times 36^{m+2}}{2^{2m+2}.3^{3m}}$ $=\frac{(2.3^2)^{m-2}\times(2.3)^{-m}\times(2^2.3^2)^{m+2}}{2^{2m+2}.3^{3m}}$ $=\frac{2^{m-2}.3^{2m-4}.2^{-m}.3^{-m}.2^{2m+4}.3^{2m+4}}{2^{2m+2}.3^{3m}}$ $=\frac{2^{m-2-m+2m+4}.3^{2m-4-m+2m+4}}{2^{2m+2}.3^{3m}}$ $=2^{2m+2-2m}.3^{3m-3m}$ $=2^2$	✓ prime bases ✓ raising powers ✓ simplification ✓ answer	(4)
2.3.2	$\frac{y^2-y-2}{y^2-4}\times\frac{y^2+2y}{y^2+y}$ $=\frac{(y-2)(y+1)}{(y-2)(y+2)}\times\frac{y(y+2)}{y(y+1)}$ $=1$	✓ factors of trinomial ✓ difference of 2 squares ✓ common factor ✓ answer	(4)
2.4	 $Area = (6x+3)(4x+2)$ $Area = (24x^2+12x+12x+6)\text{ units}^2$ $Area = (24x^2+24x+6)\text{ units}^2$	Students do not need to expand binomial x binomial ✓ $(6x+3)$ ✓ $(4x+2)$ ✓ $A=l\times w$	(3)
			[18]

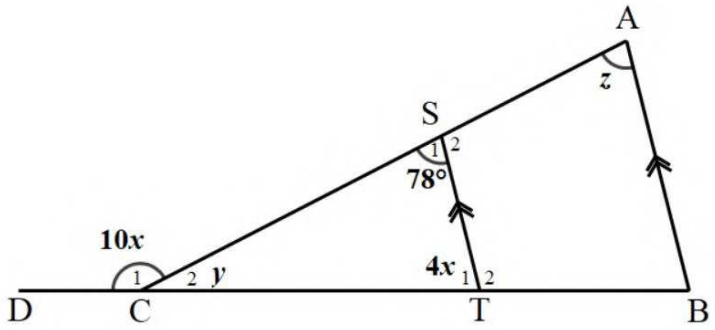
QUESTION 3

3.1.1	$\frac{3}{x+2}+\frac{5}{x-4}=2$ $LCD:(x+2)(x-4)$ $RESTR: x\neq -2 \text{ or } x\neq 4$ $3(x-4)+5(x+2)=2(x+2)(x-4)$ $3x-12+5x+10=2(x^2-2x-8)$ $8x-2=2x^2-4x-16$ $2x^2-12x-14=0$ $2(x-7)(x+1)=0$ $\therefore x=7 \text{ or } x=-1$	✓ LCD ✓ numerator ✓ CA factors ✓ CA	(4)
3.1.2	$5^{x-4}+5^x=626$ $5^x.5^{-4}+5^x=626$ $5^x(5^{-4}+1)=626$ $5^x(5^{-4}+1)=626$ $5^x=625$ $5^x=5^4$ $\therefore x=4$	✓ common factor ✓ 625 ✓ answer	(3)
3.2	$-6\leq 2x-2<10$ $-4\leq 2x<12$ $-2\leq x<6$ 	✓ $-4\leq 2x<12$ ✓ $-2\leq x<6$ ✓ number line / notation	(3)
3.3	$4a-b=5 \quad (Eq1)$ $-3a+4b=19 \quad (Eq2)$ $Eq1\times 4\rightarrow \quad 16a-4b=20$ $Eq1+Eq2 \quad \underline{-3a+4b=19}$ $13a \quad =39$ $\therefore a=3$ $Sub\ a=3\ in\ Eq1\rightarrow\ 4(3)-b=5$ $\therefore b=7$ OR	✓ $Eq1\times 4$ ✓ Adding eqs ✓ $a=3$ ✓ substitution ✓ b = 7 ✓ $b=4a-5$ ✓ $Sub\ Eq3\rightarrow Eq2$	(5)

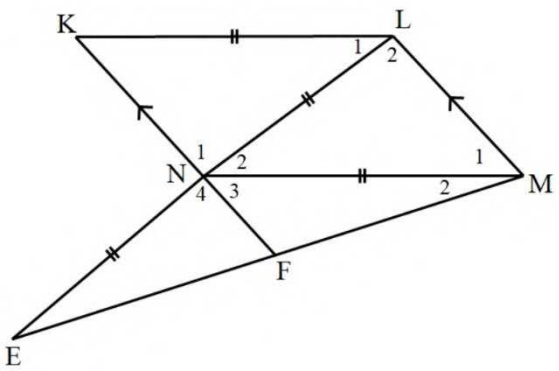
	$4a-b=5 \quad (Eq1)$ $-3a+4b=19 \quad (Eq2)$ $Eq1 \rightarrow Eq3 \quad b=4a-5$ $Sub\ Eq3\ in\ Eq2: \quad -3a+4(4a-5)=19$ $-3a+16a-20=19$ $13a=39$ $\therefore a=3$ $Sub\ a=3\ in\ Eq1 \rightarrow 4(3)-b=5$ $\therefore b=7$	✓ $a=3$ ✓ substitution ✓ b = 7	(5)
			[15]

Give reasons for your statements in the answers to QUESTIONS 4 and 5.

QUESTION 4

4.1	 $10x = 78° + 4x \quad (\text{ext } \angle \text{ of } \Delta STC)$ $6x = 78^o$ $x = 13^o$ $y = 180^o - [78^o + 4(13^o)] \quad (\text{sum of } \angle s\ \Delta STC)$ $y = 50^o$ OR $y = 180^o - (10 \times 13^o) \quad (\text{sum of } \angle s \text{ st. line})$ $y = 50^o$ $z = 78^o \quad (\text{corresp } \angle s;\ ST // AB)$	✓ S ✓ R ✓ S/R ✓ S/R ✓ S/R	(4)
4.2	Rhombus Square Rectangle	✓ answer ✓ answer ✓ answer	(3)
			[7]

QUESTION 5



5.1	$\hat{M}_1 = \hat{L}_2$ $(\angle s \text{ opp} = \text{sides})$ but $\hat{N}_1 = \hat{L}_2$ $(\text{alt } \angle s;\ KN \parallel LM)$ $\hat{N}_1 = \hat{K}$ $(\angle s \text{ opp} = \text{sides})$ $\therefore\ \hat{M}_1 = \hat{K}$	✓ S/R ✓ S/R ✓ S/R	(3)
5.2	In ΔKLN and ΔMNL: 1. LN is common 2. $\hat{K} = \hat{M}_1$ (proved above) 3. $\hat{N}_1 = \hat{L}_2$ *alt* $\angle s$; $KN \parallel LM$ $\therefore$ ΔKLN and ΔMNL (A; A; S)	✓ S/R ✓ S/R ✓ S/R ✓ S/R	(4)
5.3	$KL = NM$ (*given*) $KN = ML$ (*congruent* Δs *proved above*) $\therefore$ $KLMN$ is a parallelogram. Reason: 2 Pairs of opp sides equal and parallel	✓ S ✓ R ✓ S/R	(3)
5.4	$\hat{M}_1 + \hat{M}_2 + \hat{L}_2 + \hat{E} = 180°$ (*sum* $\angle s$ *of* ΔNME) *but* $\hat{L}_2 = \hat{M}_1$ ($\angle s$ *opp* = *sides*) *and* $\hat{E} = \hat{M}_2$ ($\angle s$ *opp* = *sides*) $\therefore \hat{M}_1 + \hat{M}_2 + \hat{M}_1 + \hat{M}_2 = 180°$ $2\hat{M}_1 + 2\hat{M}_2 = 180°$ $2(\hat{M}_1 + \hat{M}_2) = 180°$ $\hat{M}_1 + \hat{M}_2 = 90°$ $\therefore L\hat{M}E = 90°$	✓ S/R ✓ S/R ✓ S/R ✓ substitution ✓ simplification	(5)
			[15]

TOTAL: 75